REMARKS

This responds to the Office Action mailed on February 17, 2006. Reconsideration is respectfully requested.

Status of Claims

By this amendment, claims 1, 2, 4, 6 – 9, 11, 12 and 14 – 18 are amended, claims 3, 5 and 19 are canceled, and no claims are added. Claims 20 – 37 are currently withdrawn from consideration. As a result, claims 1, 2, 4, 6 – 18 and 20 – 27 remain pending in this application.

§103 Rejection of the Claims

Claims 1 – 5 and 9 – 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Burdon (U.S. 6,572,830) in view of Riemer et al. (U.S. 5,886,671). Claims 6 - 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Burdon (U.S. 6,572,830) in view of Brown et al. (U.S. 6,765,535) and applied to claims 1 – 5 and 9 – 19 above, and in view of Dion (U.S. 5,101,086).

Applicants submit that the rejection of claims 6 – 8 "in view of Brown", should instead state "in view of Riemer" because the Riemer reference was used to reject claims 1 – 5 and 9 – 19 above and the Brown reference was disqualified as prior art per Applicants' response filed 5-25-05. Applicants have responded with this assumption.

Applicants' claims 1, 2, 4, 6 – 14 and 17 – 18 are directed to a millimeter-wave surface-heating system that uses an active reflect-array antenna system. Applicants' claims 15 and 16 are directed to a millimeter-wave surface-heating system that uses a passive reflect-array antenna. Claim 15 has been rewritten in independent form to separately claim these embodiments previously recited in claims 15 and 16.

Applicants' claims 1, 2, 4, 6 – 14 and 17 – 18 are directed to a surface-heating system that includes an active reflect-array antenna system and a low-power feed. The active reflect-

array antenna system provides a collimated high-power wavefront at a millimeter-wave frequency in a direction of a surface to heat the surface within a surface depth by reflecting a spatially-fed millimeter-wave lower-power wavefront. The low-power feed provides the spatially-fed millimeter-wave lower-power wavefront for incident on the active reflect-array.

Claim 2 for example, recites that the active reflect-array antenna system comprises a plurality of individual semiconductor wafers arranged together on a surface. As further recited in claim 2, each semiconductor wafer comprises a receive antenna to receive signals of the spatially-fed millimeter-wave lower-power wavefront, a set of power amplifiers coupled to the receive antenna to amplify the received signals, and a transmit antenna to transmit amplified millimeter-wave signals. As further recited in claim 2, the amplified millimeter-wave signals from the transmit antennas of each semiconductor wafer spatially combine to generate the collimated high-power wavefront.

Applicants submit that none of the cited references, either separately, or in combination, teach, suggest or motivate the following elements:

1) an active reflect-array antenna;

2) reflecting spatially-fed signals;

3) the use of millimeter-wave signals to heat within a surface depth;

4) a plurality of semiconductor wafers arranged on a surface, each with a receive antenna, an amplifier and a transmit antenna (per claim 2); and

5) The spatial-combining of amplified millimeter-wave signals transmitted by the transmit antennas of each semiconductor wafer (per claim 2).

Discussion or Burdon:

Burdon is directed to microfluidic devices arranged in multiple layers to provide integrated and monolithic structures. Basically, Burdon discloses sintering together green-sheet layers. Applicants' claim 1, however, discloses an active reflect array antenna system that reflects millimeter-wave signals. Applicants' claim 2 recites that the active reflect-array antenna system comprises a plurality of individual semiconductor wafers arranged together on a surface. Burdon discloses layers of green-sheet sintered together to form a single monolithic structure.

Applicants' semiconductor wafers are *individual wafers* arranged together on a surface. In view of this, Applicants submit that combining Burdon with any of the other cited references does not result in Applicants' claimed invention.

Applicants' claim 4, for example, recites that the semiconductor wafers are arranged in a substantially parabolic shape. Because a single monolithic structure cannot be parabolic shaped, the individual semiconductor wafers of Applicants' claims 2 and 4, are recited as separate wafers so that they may be arranged on a non-flat parabolic surface. Because Burdon is directed to generating a single monolithic structure, Applicants submit that Burdon ***teaches away*** from Applicants' claimed invention.

Applicants further submit that Burdon is non-analogous art because it is directed to semiconductor fabrication while Applicants' invention is directed to a surface-heating system that uses an active reflect-array antenna system. Analogous art is all art that is either in the field of technology of the claimed invention or deals with the same problem solved by the claimed invention even though outside the field of technology. *In re Wood*, 599 F.2d 1032, 202 USPQ 171 (CCPA 1979). Since the problems solved by Burdon relate to fabricating multi-layered substrates while Applicants are directed to surface-heating using millimeter waves, Applicants submit that those of skill in the art would not look to the field of fabricating multi-layered substrates to solve problems related to surface-heating using millimeter waves. This is further emphasized by the fact at Burdon is in US class and field of search 422, not in field 343.

Discussion or Riemer:

According to the Examiner, Riemer discloses a reflection system that redirects waves and uses an antenna array. Applicants respectfully disagree with this interpretation of Riemer as applied to Applicants' claims and submit that Riemer does not teach, suggest or motivate the reflection of a received wavefront to generate a collimated-high-power wavefront as recited in Applicants' amended claim 1.

In Riemer, signals are received from DBS satellites using probes 502 and 504 and processed in module 408 (see Riemer FIG. 5). The processed signals from a module 408 are combined with signals from other modules 408 in a stripline combining network (see Riemer

FIG. 5). After being combined, the received DBS satellite signals are provided to active phased-array modules 1200 which transmit the signals. In other words, Riemer discloses a repeater.

The only ***reflection*** of signals disclosed in Riemer is the reflection of EM signals by circular metal plate 1214 within metal can 602 for the purpose of lowering the waveguide cutoff frequency (see Riemer column 17, lines 23 – 33 and FIG. 12). The phased-array antenna of Riemer uses active phased-array modules 1200 to transmit signals. In Riemer, microstrip-to-waveguide transitions use radiating probes 1204 to convert RF signals from stripline for transmission by each module. The RF signals are provided by the stripline combining network from electronic modules 408 to probes 1204 (see Riemer column 16, lines 56 – 67 through column 17 lines 1 – 33 and FIG. 12). In other words, Riemer's phased array transmits RF signals provided by an external source. There is no ***reflection*** of a received wavefront as recited in Applicants' claim 1. Furthermore, there is no active reflect-array antenna that reflects spatially-fed millimeter wave signals. Furthermore, there is no active reflect-array antenna that comprises individual semiconductor wafers that individually receive, amplify and retransmit signals, as recited in claim 2.

Discussion or Dion:

Dion has been cited by the Examiner in the rejection of claims 6 – 8 for disclosing a surface temperature sensor. Although Dion discloses surface temperature sensors, Applicants submit that Dion is non-analogous art. Dion is directed to induction heating using a magnetic core. The heat is generated by eddy currents resulting from a variable magnetic field (see Dion abstract and column 1, lines 8 - 25). Applicants submit that this is different than surface heating with a directed high-power wavefront. In Dion, an open core of ferrite material wrapped with a coil is embedded in a thermally conductive material. Dion does not use directed millimeter-waves, but excites a coil with frequencies between 12 to 25 kHz (see Dion abstract).

Dion is non-analogous art because it is directed to induction heating while Applicants' invention is directed to a surface-heating system that using millimeter-waves. Analogous art is all art that is either in the field of technology of the claimed invention or deals with the same problem solved by the claimed invention even though outside the field of technology. *In re*

Wood, 599 F.2d 1032, 202 USPQ 171 (CCPA 1979). Since the problems solved by Dion relate to induction heating in electrically conductive material, while Applicants are directed to surface-heating using millimeter waves, Applicants submit that those of skill in the art would not look to the field of induction heating to solve problems related to surface-heating using millimeter waves. This is further emphasized by the fact at Dion is in US class and field of search 219, not in field 343.

Discussion of other claims:

Applicants' claim 8 recites that the antenna system generates a pulsed high-power wavefront and that the antenna system reduces one of either a pulse-repetition-rate or a pulse-duration time of the high-power wavefront in response to the control signal to control the surface temperature. Applicants' find no teaching, suggestion or motivation in any of the cited references to 1) generate a pulsed high-power wavefront, or 2) reduces either a pulse-repetition-rate or a pulse-duration time of the high-power wavefront to control a surface temperature.

In Riemer, DBS signals are transmitted, so there is no pulse-repetition-rate or pulse-duration time. In Burdon, no RF signals are used. In Dion, continuous wave low-frequency signals are used (see Dion column 3, lines 30 – 36). The use of millimeter-wave pulsed signals in a wrapped open core of ferrite material would generate virtually no EM field. Applicants submit that Dion's induction heating system would be inoperable with millimeter-wave signals because millimeter wave signals would not propagate through a coil of wire generating a magnetic field. A waveguide, microstrip line, a stripline or other signal path suitable for millimeter-waves would be required, none of which is taught by Dion.

Claim 11, as amended, further distinguishes over the cited references by reciting that the low-power feed is also an active reflect array. In these embodiments, two active reflect arrays are recited (i.e., the low-power feed and the active reflect array). In these embodiments, a source provides millimeter-wave signals that are received, amplified and then re-transmitted by the low-power feed for incidence on the active-reflect array. The active-reflect array receives the signals,

further amplifies the signals and then transmits the amplified signals to generate the collimated wavefront. None of this is taught, suggested or motivated by the cited references.

Claim 17 further distinguishes over the cited references by reciting that a plurality of differing millimeter-wave frequencies are used and that the frequency and power level of the wavefront is controlled to selectively heat layers of the surface. Claim 18 further distinguishes over the cited references by reciting that the differing millimeter-wave frequencies are time-multiplexed.

Discussion of claims 15 and 16 - Passive Reflect-Array Antenna Embodiments:

As amended, claim 15 is directed to a millimeter-wave surface-heating system that includes a reflector to reflect a high-power millimeter-wave signal, and a passive reflect-array antenna to receive the reflected high-power millimeter-wave signal and re-transmit the signal to provide a collimated high-power wavefront. As recited in claim 15, the passive reflect-array antenna comprises a plurality of dual-polarized dipoles of varying sizes arranged circumferentially in a substantially flat surface to operate as a parabolic surface to provide the collimated high-power wavefront at a millimeter-wave frequency in a direction of a surface to heat the surface. As further recited in claim 15, the reflector provides a spatially-fed millimeter-wave wavefront for incidence on the passive reflect-array antenna.

None of the cited references disclose a passive reflect-array antenna comprising dual-polarized dipoles of varying sizes arranged circumferentially in a substantially flat surface to operate as a parabolic surface. In view of this, Applicants submit that claims 15 and 16 are allowable.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney Gregory J. Gorrie (Reg. No. 36,530) at (480) 659-3314 or Applicants' below-named representative at (520) 794-4143 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 50-0888.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 26 day of September, 2006.

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